RAIB
Rail Accident Investigation Branch

Rail Accident Report

The collision of a locomotive with carriages at Great Central Railway's Loughborough Central station, 4 February 2006.

Department for Transport

Report 07/2006
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This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Contents

Introduction

1 The sole purpose of an investigation by the Rail Accident Investigation Branch (RAIB) is to prevent future accidents and incidents, and improve railway safety.

2 The RAIB does not establish blame or liability, or carry out prosecutions.

3 Access was freely given to Great Central Railway (GCR) staff, data and records, for the purposes of this investigation.

4 Appendices at the rear of the report contain Glossaries explaining the following:

- acronyms and abbreviations are explained in the Glossary at Appendix A; and
- certain technical terms (shown in *italics* where they first appear in the body of this report) are explained in the Glossary at Appendix B.

Summary

5 On the morning of 4 February 2006, steam locomotive 45305 was travelling at slow speed towards Loughborough Central station when it collided with the rearmost of six coupled carriages that were berthed in platform one. Two members of GCR's staff sustained minor injuries. The locomotive and one carriage sustained damage.

6 The immediate cause of the collision was that the driver did not apply the locomotive brake to stop and therefore the locomotive collided with the carriages.

7 Factors that contributed to the incident were most likely:

- the distraction of the driver and fireman from looking out due to doing other things at the time of the collision;
- the driver's reduced visibility due to a localised concentration of steam;
- the driver's reduced visual acuity when not wearing spectacles as required by his medical certificate.

8 Four recommendations are made in relation to:

- changes to the GCR Rule Book and training with respect to *footplate* staff keeping a good look out;
- compliance of GCR staff with the requirements of their medical certificates;
- compliance with the GCR policy on medical recertification;
- first aid kit provision in all locomotive driving cabs.

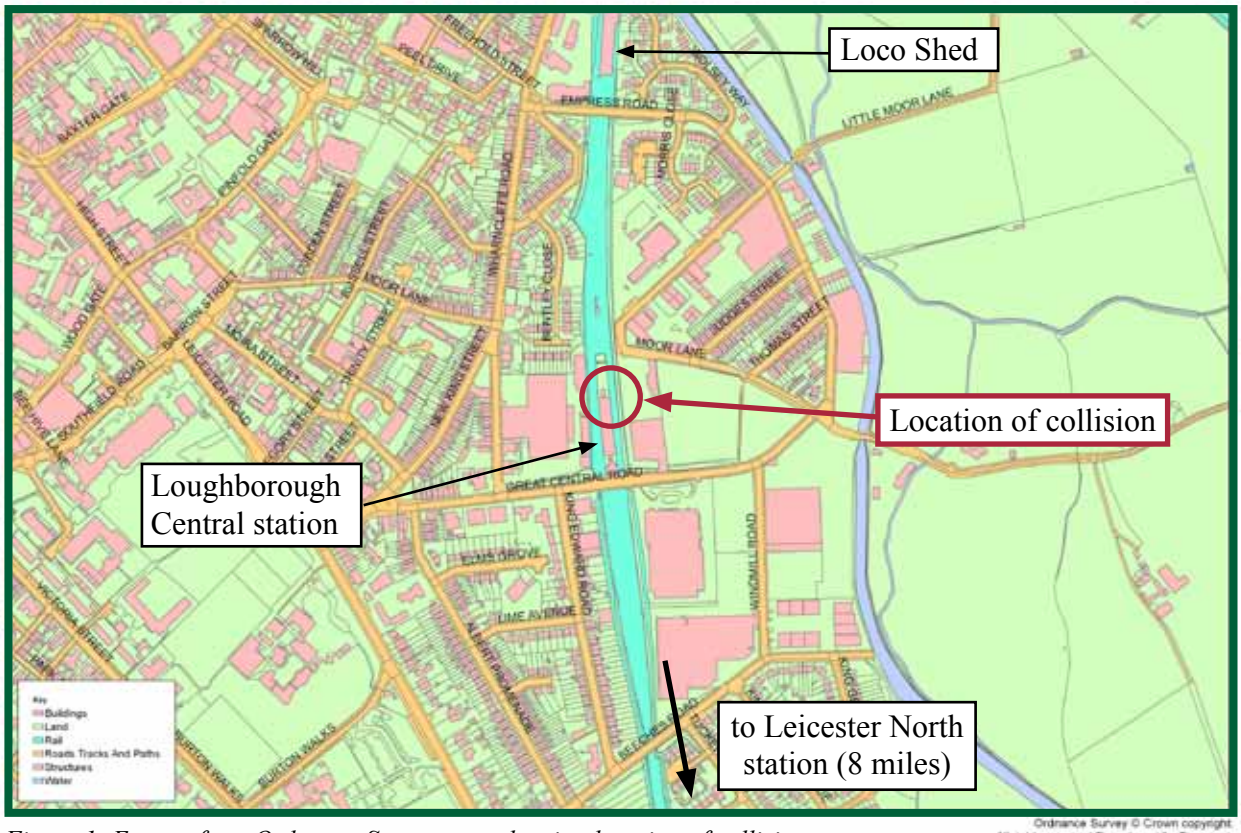

Figure 1: Extract from Ordnance Survey map showing location of collision

The Investigation

The incident

9 At 09:50 hrs on 4 February 2006, 'Black 5' steam locomotive 45305 was travelling at between 5 and 10 mph (8 and 16 km/h) towards Loughborough Central when it collided with the rearmost of six coupled carriages that were berthed in platform one. Two members of the GCR's staff sustained minor injuries. The locomotive and one carriage sustained damage.

Background

10 The GCR is the lease holder and operator of an 8 mile stretch of preserved main line railway between Loughborough Central and Leicester North stations. The line formed part of the original Great Central Railway and was purchased for preservation after closure by British Rail in 1969.

11 The GCR operates a weekend timetable and special events throughout the year. It also operates a timetable on selected weekdays from spring through to autumn. Passenger trains operate at line speeds not exceeding 25 mph (40 km/h).

12 The line speed at the location of the incident (from Loughborough signal box and through Loughborough Central) is 10 mph (16 km/h) with a reduction to 5 mph (8 km/h) through the crossover to the north of the station.

13 All locomotives are operated by the GCR, although many are owned by other companies, other preserved railways or by individuals. The GCR owns most of the carriages necessary to operate its passenger services along with a large number of supporting wagons, carriages and maintenance vehicles.

14 London Midland and Scottish Railway Company (LMS) locomotive 45305 'Alderman A E Draper' was built in 1936 by Armstrong Whitworth at Newcastle-upon-Tyne and entered service later that year. It was withdrawn from service by British Rail in 1968. It is owned by Arthur Draper and Sons Ltd and maintained by the 5305 Locomotive Association. It is passed to operate on Network Rail controlled infrastructure and returned to service from its last overhaul in autumn 2003.

15 The driver, a volunteer employee of the GCR aged 73 at the time of the incident, qualified as a driver of steam locomotives on 11 December 2000. He was experienced with LMS locomotives and their braking arrangements. He had been a fireman with British Rail from 1948 to 1956. His last medical examination was on 25 February 2005. His medical certificate states that he is fit for his duties and that he should wear glasses for driving.

16 GCR conduct theoretical and practical assessments to evaluate the ongoing competence of their drivers. Practical assessment is conducted not less than once in any 24 month period. A written theoretical assessment is conducted at intervals of not more than five years. The assessments consider the knowledge and application of rules, procedures and locomotive operation. The practical assessment, particularly, evaluates: locomotive operation using the *regulator* and controls, braking, anticipation and supervision of firing; route knowledge including attention to signals, speed limits, foot crossings and stopping at platforms and traction knowledge including the identification and documentation of faults. The driver had passed all assessments, the most recent being on 16 May 2004 and 12 March 2005.

17 The fireman, aged 68 at the time of the incident, qualified as a fireman on 4 January 2003. His next medical recertification is due in December 2006. The GCR policy requires annual recertification of footplate staff from 60 years of age.

18 The carriages berthed in platform one comprised:

- Gresley 9124 Buffet Car built at York in 1937;
- Mark 1 4662 Tourist Second Open (TSO) built at York in 1957;
- Mark 1 21242 Brake Composite Corridor (BCK) built at York in 1961;
- Mark 1 3092 First Open (FO) built at Birmingham Railway Carriage & Wagon in 1959;
- Mark 1 1526 Restaurant Kitchen Buffet (RKB) built at Cravens Railway Carriage & Wagon Company Sheffield in 1960;
- Mark 1 3126 First Open (FO) built at Swindon in 1963.

Events preceding the incident

19 Locomotive 45305 was scheduled to haul the 10:15 hrs train (2A07) from Loughborough Central to Leicester North. Prior to the incident, the locomotive was standing in the yard facing south and carriages for the train were standing in platform two. Carriages for the 11:15 hrs train from Loughborough Central to Leicester North (2A13) were standing in platform one. See Figure 2 for orientation.

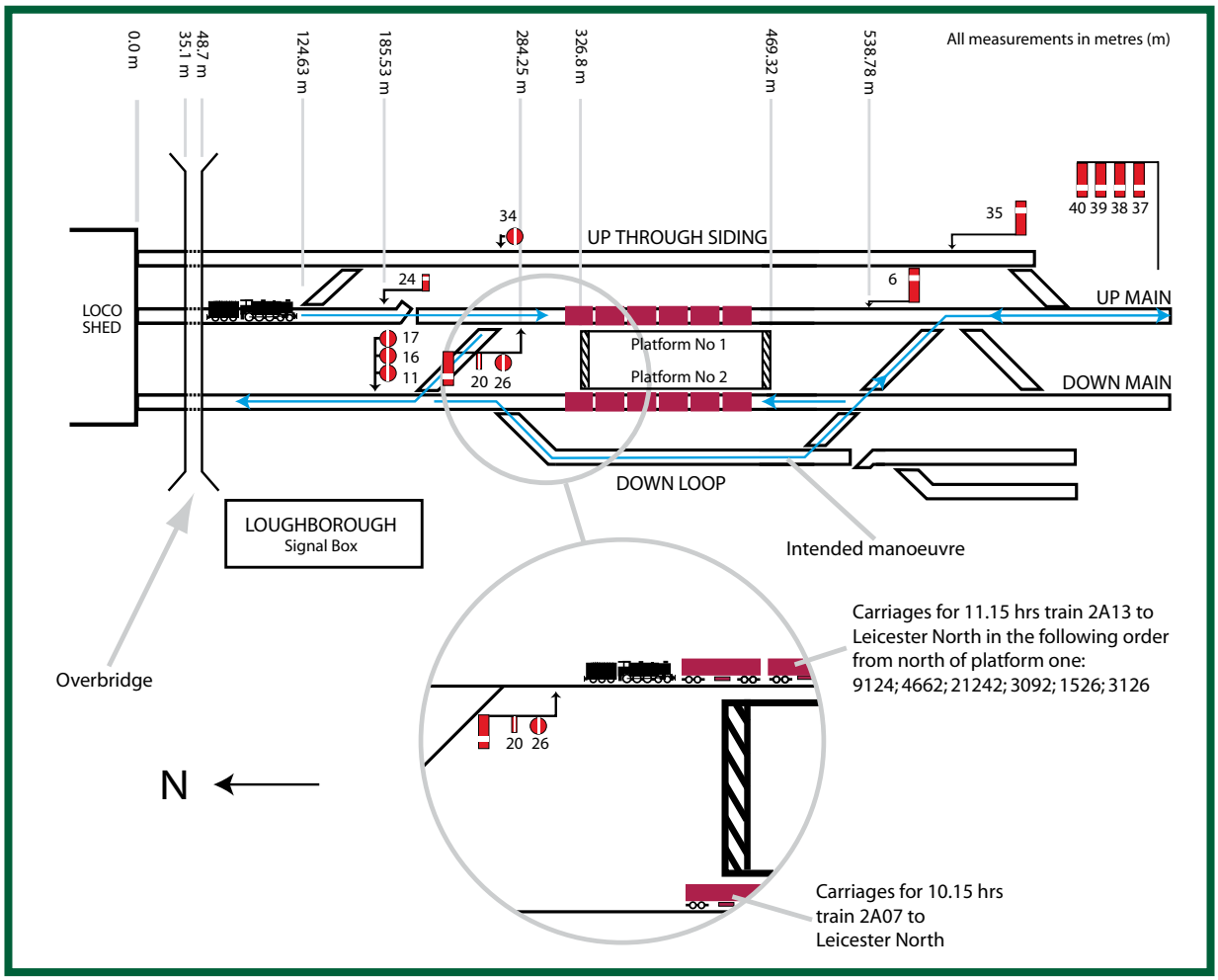

Figure 2: Loughborough Central station plan showing signals and signal reference numbers

20 The location of carriages in platforms one and two required the driver to manoeuvre locomotive 45305 as shown in Figure 2. This manoeuvre was routine and not subject to time pressure.

21 The driver checked oil levels and carried out general lubrication while the fireman prepared the fire on locomotive 45305. The locomotive and rolling stock superintendent carried out the *daily exam.* The locomotive was passed safe to operate on completion of the daily exam.

22 The driver left to prepare himself for duty while the *responsible officer* moved the locomotive to beneath the overbridge where the locomotive and rolling stock superintendent loaded coal. The task was completed and the driver returned to the locomotive at 09:45 hrs.

23 The driver moved the locomotive south beyond the overbridge and level with the signal box and carried out a brake test which was satisfactory. The time was now 09:50 hrs.

24 The driver sounded the locomotive whistle to attract the attention of the signaller who then set signal 24, a *red aspect shunting signal*, to proceed.

Events during the incident

25 The driver and fireman observed the proceed aspect of signal 24. The fireman resumed tending the fire while the driver moved the locomotive at low speed, between 5 and 10 mph (8 and 16 km/h), towards platform one. The locomotive was driven at 5 to 10 mph (8 to 16 km/h) throughout the approach. The driver checked the line ahead for the correct orientation of *hand points* and *trap points*, and sighted the carriages displaying a paraffin *tail lamp* in platform one.

26 The driver proceeded with the *cylinder drain cocks* open to allow admitted steam to dispel water from the cylinders. At this time the driver's line of sight became impaired by the resulting steam that did not disperse.

27 The driver stated that he closed the regulator valve and cylinder drain cocks in an effort to clear the steam and momentarily applied the brake as he was unaware of his precise location. The locomotive continued to move forward. The driver stated that he released the brake and then the locomotive collided with the carriages. The actions of the driver immediately prior to the collision could not be corroborated by the accounts of those who observed the incident.

28 The driver struck his head on the *ejectors* and fell to the floor, coming to rest against the *tender*. The driver sustained minor facial cuts and bruising.

29 The fireman remained standing, coming to rest against the boiler. The fireman was not injured and applied the locomotive brake when instructed to do so by the driver. See Figure 3 for the location of the locomotive brake and cab controls.

30 A member of staff preparing the dining area of carriage 9124 fell to the floor and sustained minor bruising to head and body.

31 Both the driver and staff member who sustained injuries were treated at the Loughborough NHS Walk-In Centre. Both were discharged later the same day.

32 The impact from the locomotive pushed the carriages eight metres south along platform one leaving a number of wheel slide marks visible on the rail head.

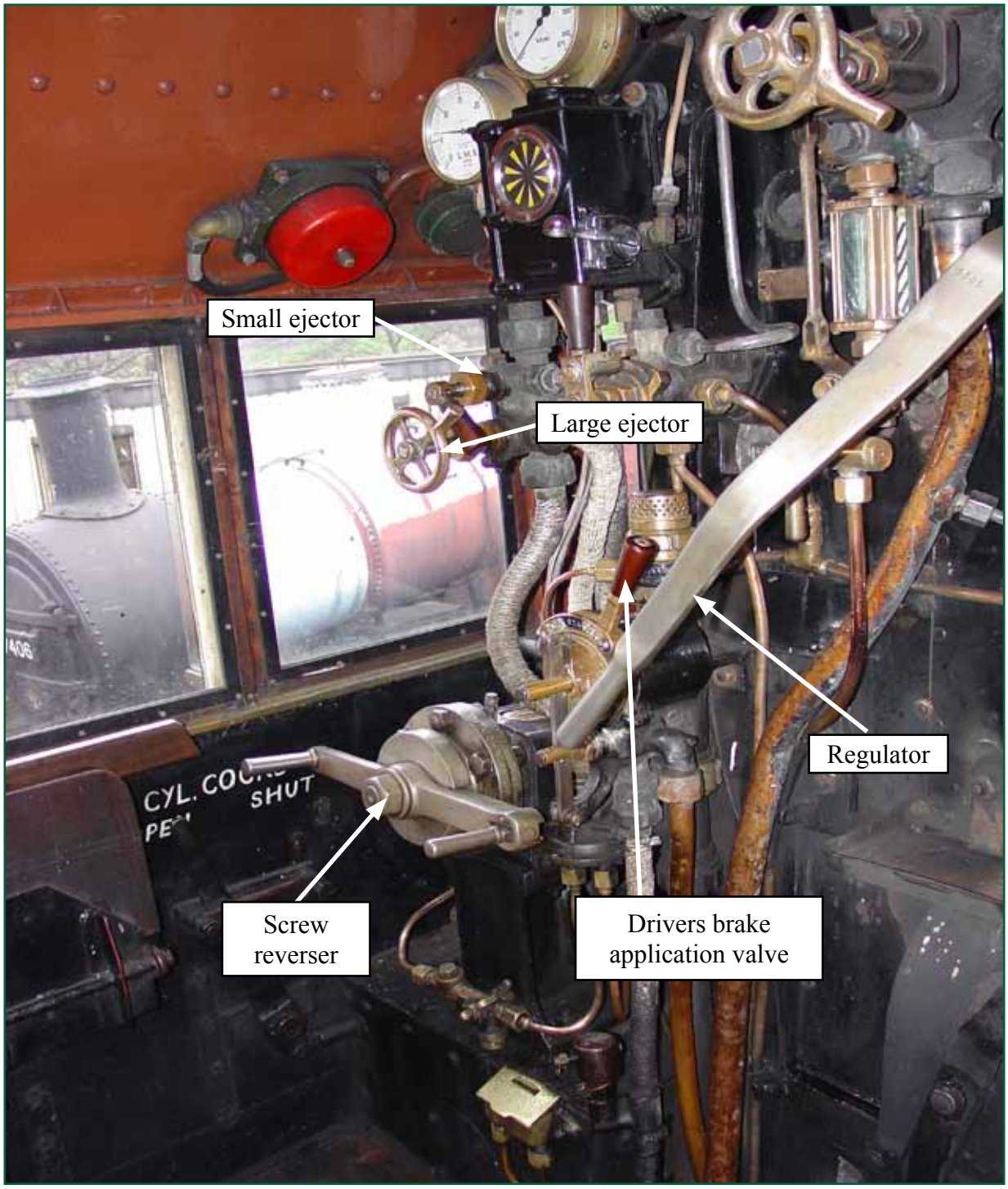

Figure 3: Locomotive 45305 cab controls

33 Only the locomotive and carriage 9124 sustained minor damage. There was minor movement of the locomotive *buffer*s relative to the *buffer beam* as evidenced by cracked paint at the interface (Figure 4). The buffer beam was slightly deformed. Carriage 9124 sustained damage to its buffers and the coupler casting at its coupling to carriage 4662. The buffers had moved relative to the buffer beam, evidenced by cracked paint at the interface. The coupler casting was cracked (Figures 5, 6 & 7).

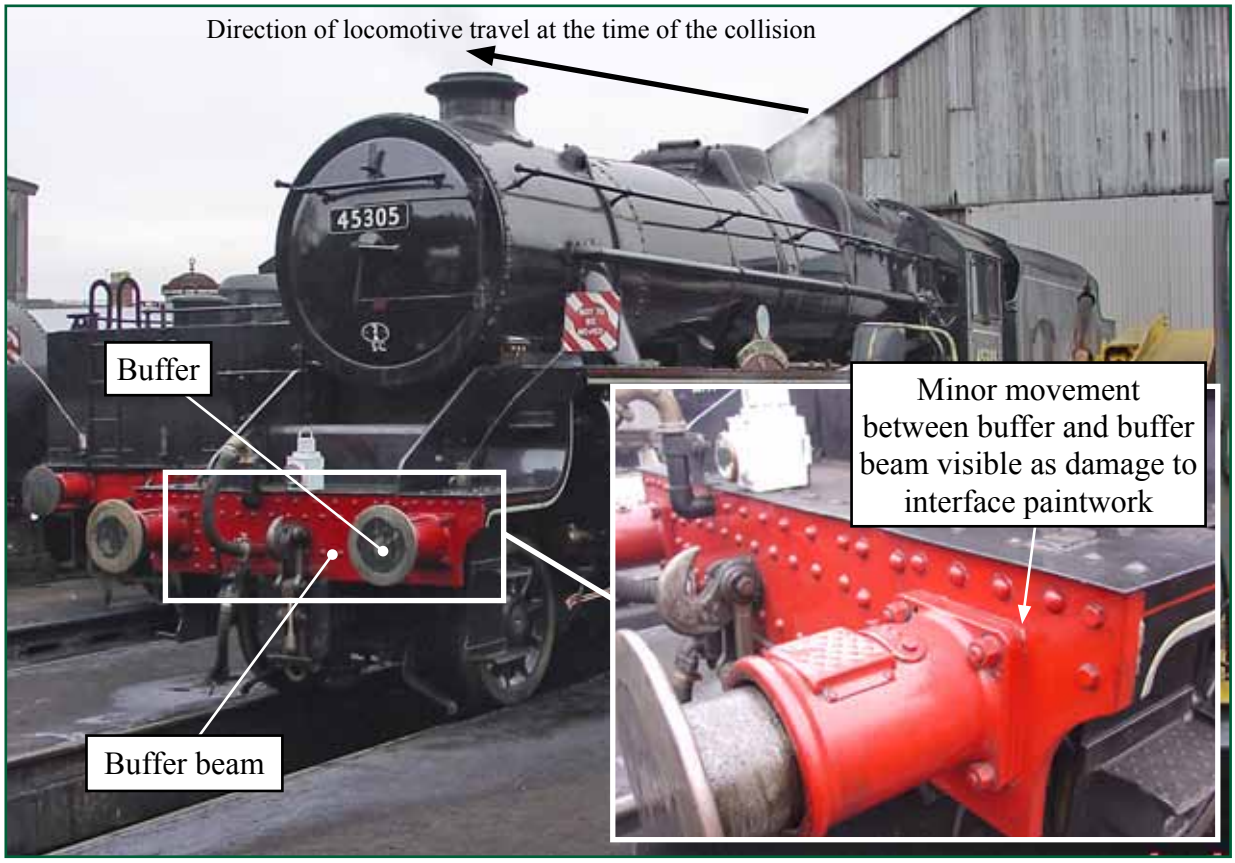

Figure 4: Locomotive 45305 with damaged buffer and buffer beam

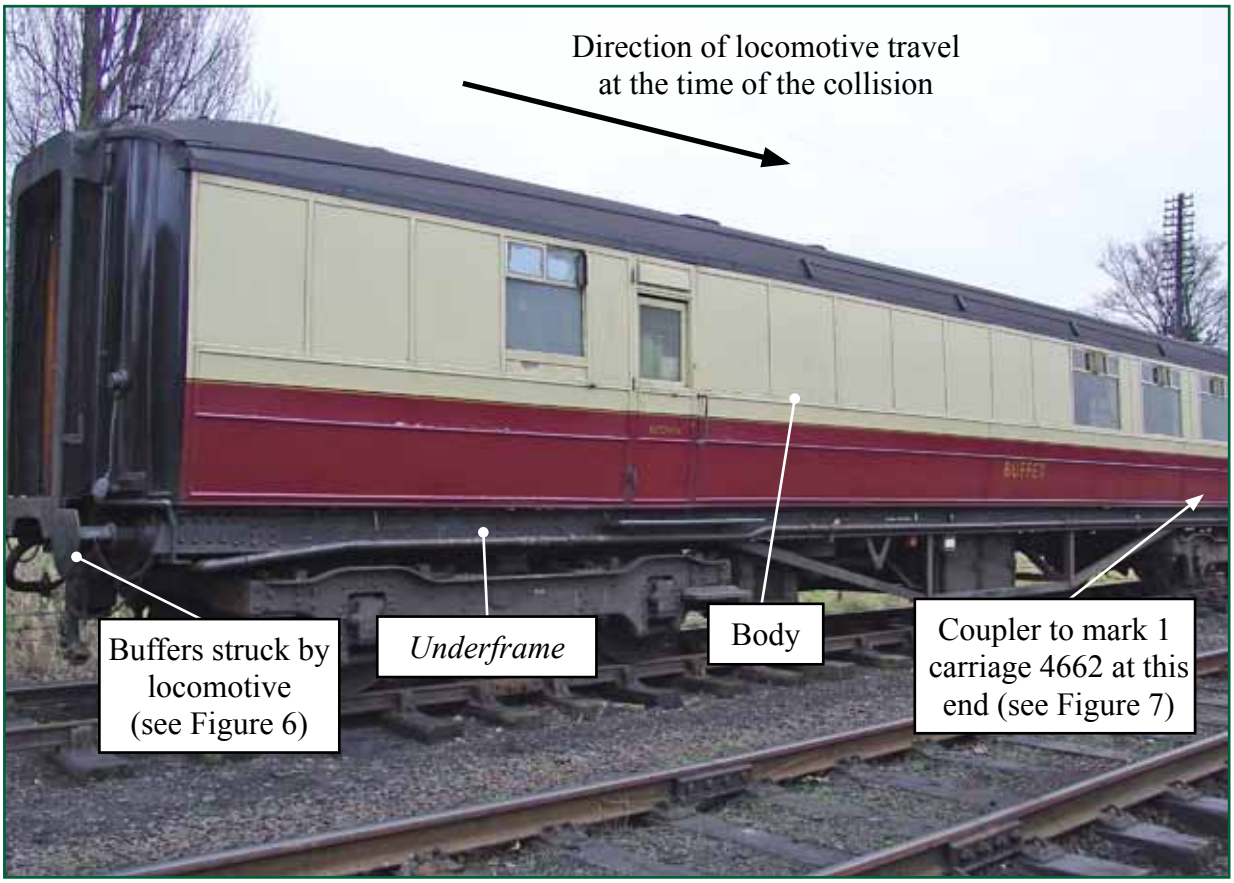

Figure 5: Carriage 9124

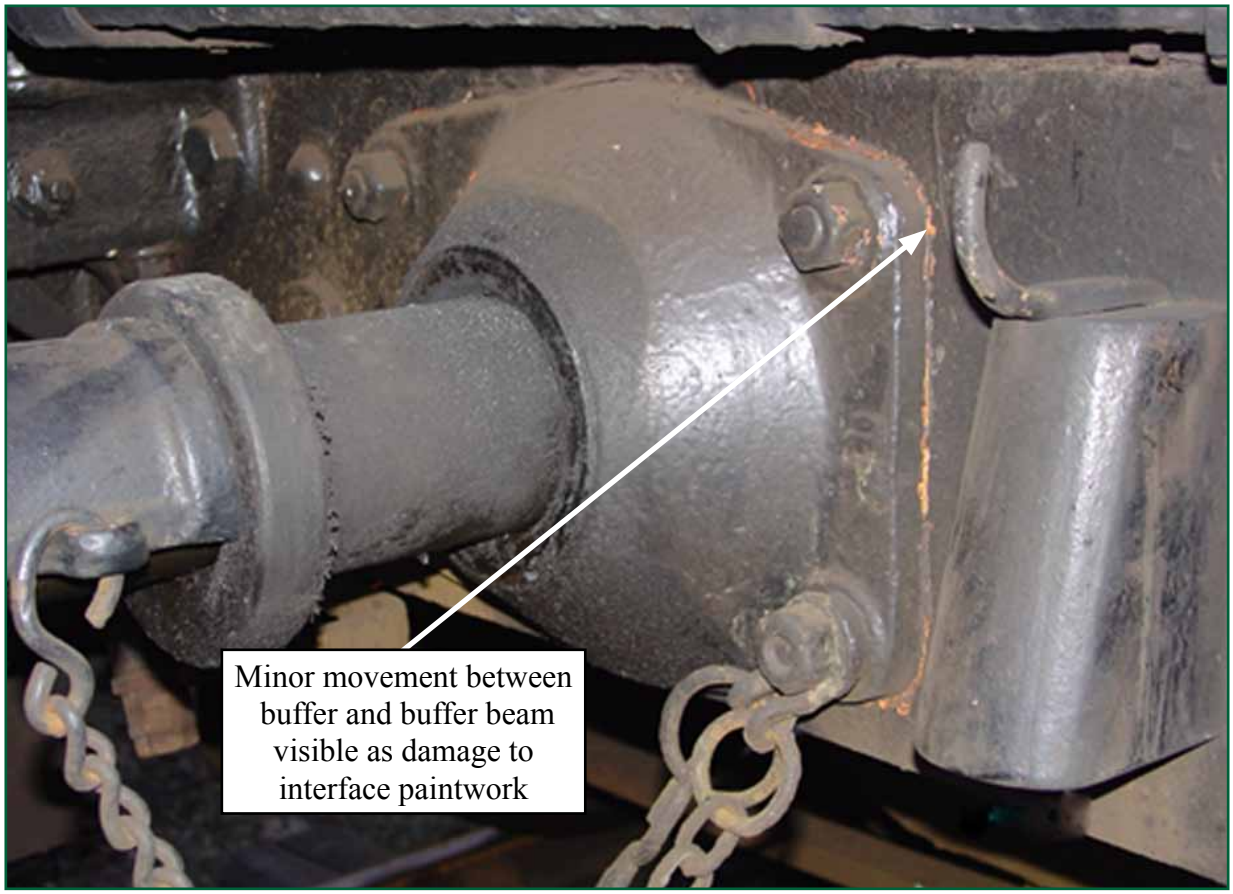

Figure 6: Carriage 9124 buffer struck by locomotive

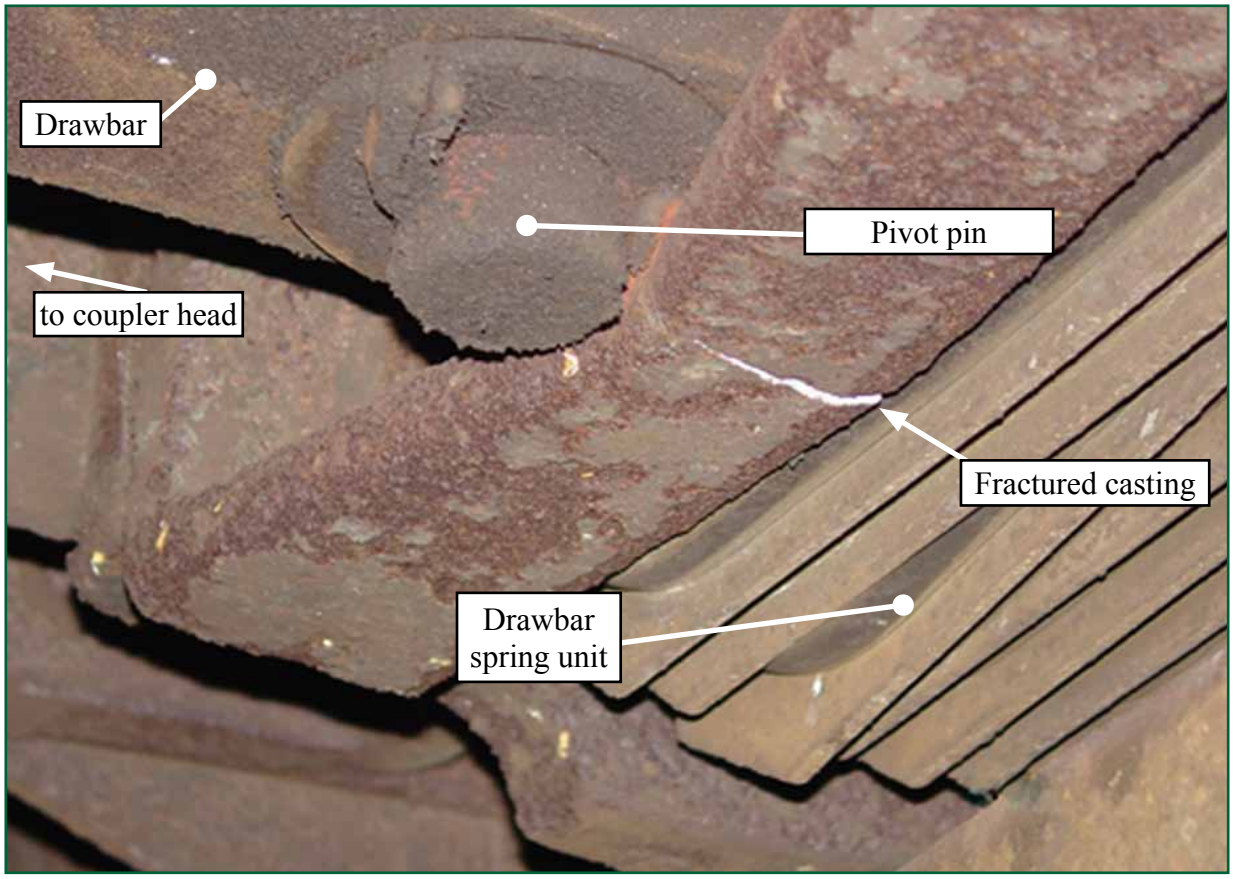

Figure 7: Carriage 9124 coupler connected to Mark 1 carriage 4662

Analysis

34 The causal analysis into the incident is given in Figure 8. The locomotive passed braking tests during daily exam, during the driver's brake test and in a post incident test. Neither the wheels nor the railhead were contaminated, therefore adhesion conditions were normal. Thus a brake irregularity was not contributory to the incident.

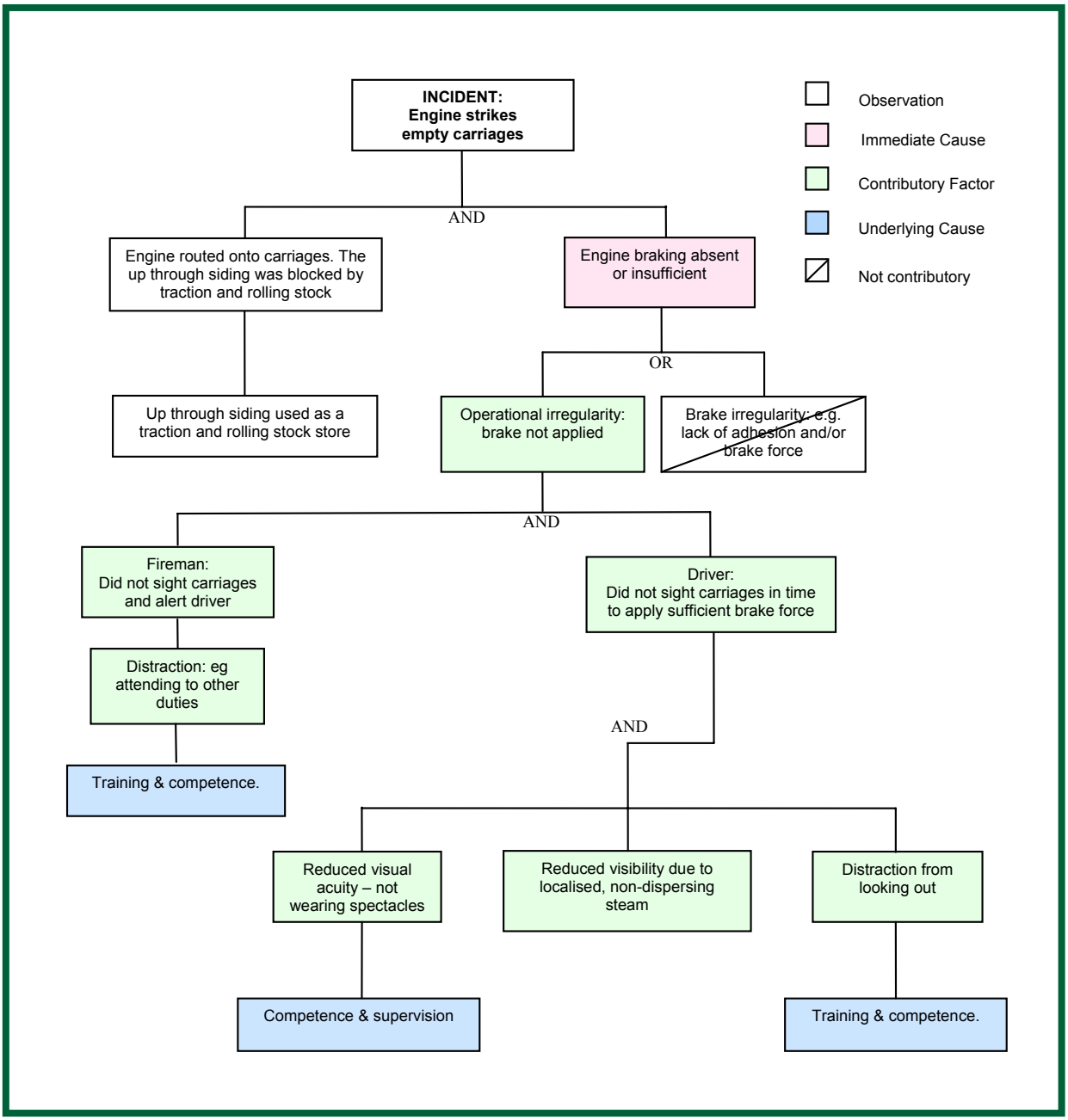

Figure 8: Causal Analysis

35 The driver was aware he was to execute a routine manoeuvre using the *Down* loop to run around and couple to the carriages at platform two south. See Figure 2 for details. The Down loop is a *bi-directional*, fully signalled and *track circuit*ed line.

36 The *Up* through siding was not used to run around the carriages for the following reasons:

- it is designated a siding and not a loop;
- it is used to store heritage diesels and carriages as there is nowhere else for storage that is secure and less prone to vandalism;
- it is not in a sufficiently good condition to permit the regular passage of mainline locomotives;
- access from the north end (locomotive shed to siding) is not a signalled move;
- it is not track circuited: traffic is only under the control of the signalman when it is ready to depart the siding.

37 A reconstruction of the locomotive's approach to platform one from the locomotive shed was undertaken before the hours of darkness on the evening of 4 February 2006. The locomotive used for the reconstruction was former Great Western Railway locomotive 5199.

38 The driver's side on locomotive 5199 is to the right hand side of the cab, which allowed the reconstruction sighting to be done from the left hand side of the cab, the driver's side on locomotive 45305.

39 The reconstruction ascertained the influence on sighting distance of infrastructure, stabled rolling stock, track curvature and vegetation from the driver's side of locomotive 45305. Carriages stabled in platform one could be sighted at a distance of 189 metres.

40 A study was undertaken into the environmental conditions at the time of the incident. The conditions are summarised in Figure 9. The data show that a driver travelling south between 09:00 hrs and 10:00 hrs would have experienced a light north westerly breeze. This breeze would have blown steam in the direction of travel, toward the driver's side and against the stationary rolling stock on the Up through siding. The driver stated that he closed the regulator valve and cylinder drain cocks in an effort to clear the steam. However, this would not have caused the steam to clear immediately. Thus environmental conditions may have caused steam to collect and impair the driver's visibility. This is considered likely to be a contributory factor.

Meteorological Data for Sutton Bonington - 4.95 miles NW of GCR Loughborough Central Station

Date	Time (hh:mm)	Rain (mm)	Wind mean (kn)	Wind mean direction (deg)	Wind gust (kn)
04/02/2006	09:00	0.0	3	310	4
04/02/2006	10:00	0.0	4	290	7

Figure 9: Meteorological data

41 Rule 17(f) of the GCR Rule Book states that 'The Driver must keep a good look out when the engine is in motion...'. This is comparable with Rule 127(v) of the British Railways 1950 Rule Book, which states 'The driver must keep a good look-out when the engine is in motion...'.

42 The driver stated that he was doing things other than keeping a good look out when the engine collided with the carriages (paragraph 27).

43 Rule 18 of the GCR Rule Book states that 'The fireman must when not otherwise engaged, observe and obey all signals and keep a good look out when the engine is in motion'. This is comparable with Rule 128 of the British Railways 1950 Rule Book, which states 'the fireman must when not necessarily otherwise engaged observe and obey all signals and keep a good look-out all the time the engine is in motion'.

44 At this time, the fireman was not looking out as he was attending to the fire.

45 Distraction of the driver and fireman from looking out is considered likely to be a contributory factor (Recommendation 1).

46 The driver stated that he did not need his spectacles for driving in daylight although he was aware that it was a requirement of his medical certificate. The driver's reduced visual acuity when not wearing spectacles is considered likely to be a contributory factor (Recommendation 2).

47 The crew misjudged the separation of the locomotive from the carriages, most likely due to reduced visibility - a combination of collecting steam and the driver's uncorrected eyesight - and distraction from keeping a good look out due to doing other things. The immediate cause of the incident was that the driver did not apply the locomotive brake to stop and therefore the locomotive collided with the carriages.

48 The GCR does not have a Drugs & Alcohol (D&A) Policy that requires staff to be *'for cause'* tested following an accident or incident. For this reason, no post incident screening was undertaken. However, during the time that the driver was on site, he was seen by many people. It was apparent that the driver's behavior was normal with nothing to indicate that he was under the influence of either drugs or alcohol.

49 The absence of a D&A Policy that would require 'for cause' testing is permitted by Heritage Railway Association guidelines and endorsed by Her Majesty's Railway Inspectorate (HMRI) as the railway has a low maximum speed and is not connected to the mainline railway network. It is noted that Section 5 of the GCR Rule Book states that 'Staff must not report for duty under the influence of intoxicating drink or any drugs that might impair the proper performance of their duties, or consume such while on duty'.

50 The driver's medical certificate required him to undergo biennial medical recertification. This is contrary to the GCR policy which requires annual recertification of footplate staff from 60 years of age (Recommendation 3)**.**

51 After the incident, staff that attended to the injured driver could not locate a first aid box. HMRI Railway Safety Guidance and Principles Part 2 Section H Minor Railways Paragraph 411 refers to footplate and driving cabs and states that 'A first-aid kit should be provided and its position clearly indicated' (Recommendation 4)**.**

Conclusions

52 The immediate cause of the incident was that the driver did not apply the locomotive brake to stop and therefore the locomotive collided with the carriages.

53 Contributory factors were most likely:

- the distraction of the driver from keeping a good look out due to doing other things at the time of the collision;
- the distraction of the fireman from keeping a good look out as he was attending to the fire;
- the driver's reduced visibility due to a localised concentration of steam;
- the driver's reduced visual acuity when not wearing spectacles as required by his medical certificate.

Actions already taken or in progress

54 A reminder has been issued to GCR locomotive drivers of their responsibility for all matters on the footplate, including the requirement for firemen to look out when shunting, buffering up, passing a subsidiary signal, when approaching a station or crossing, or working within station limits. GCR memorandum dated 7 March 2006 refers.

Recommendations

55 Implementation of the recommendations below is the responsibility of the organisations identified in each one. When they have considered the recommendations, the organisations should establish a priority and timescale for the necessary work, taking into account their health and safety responsibilities and the risk profile of their activities.

1 The Great Central Railway should revise its Rule Book and training to require:

- drivers to keep a good look out and not, unless absolutely necessary, operate controls other than those used for driving when proceeding at caution as far as the line is clear, and when staff, members of the public and other rail vehicles may be nearby (paragraph 45);
- firemen to keep a good look out when proceeding at caution as far as the line is clear, and when staff, members of the public and other rail vehicles may be nearby (paragraph 45).

2 The Great Central Railway should put in place a supervisory system to ensure that members of its staff comply with the requirements of their medical certificates (paragraph 46).

3 The Great Central Railway should put in place a supervisory system to ensure that its policy on medical certification and recertification is properly applied to all staff (paragraph 50).

4 The Great Central Railway should ensure that a first-aid kit is provided and its provision clearly indicated in all locomotive driving cabs (paragraph 51).

Appendices

Glossary of abbreviations and acronyms — Appendix A

GCR	Great Central Railway
HMRI	Her Majesty's Railway Inspectorate
LMS	London, Midland and Scottish Railway Company

Glossary of terms — Appendix B

Bi-directional (line)	Single line that is fully signalled to take trains in both directions.
Buffer	A cushioning device mounted on a vehicle's extreme ends used to absorb shocks from coupling and relative motion.
Buffer beam	The transverse structural member upon which the buffers are mounted.
Cylinder drain cocks	Drain ports fitted to a locomotive's cylinders. The drain cocks are held open as the locomotive is started from cold to allow the admitted steam to drive any water from the cylinders. The cocks can be closed once the locomotive is moving and the cylinders are warm.
Daily exam	A 28-point testing and inspection programme designed to ensure that the locomotive is safe to operate. The daily exam includes checks for the correct function of suspension, braking, drawgear etc.
Down	Line in the direction away from Leicester North station (in this case).
Ejector	A steam-operated device for creating a vacuum on trains equipped with a vacuum brake. The large ejector evacuates the brake pipe and releases the brake. The small ejector maintains the brake pipe vacuum to overcome minor leakage.
Footplate	The part of a railway locomotive on which the driver and fireman stand.
'For cause' (testing)	Testing to identify whether or not drugs or alcohol are present in a person where there are reasonable grounds to suspect that the fitness of that person contributed to the cause of an accident or incident.
Hand points	Points that are worked manually by an adjacent lever.
Red aspect shunting signal	A shunting signal that displays a red aspect is a stop signal. In this incident the signal is a small red semaphore arm with a vertical white stripe. This signal shows the following indications: (i) Normal (meaning stop): Indication by day - arm horizontal; Indication by night - red light. (ii) Proceed (meaning proceed at caution as far as the line is clear): Indication by day - arm raised 45°; Indication by night - green light.
Regulator	A lever used to operate the regulator valve, admitting steam to the cylinders and providing drive for the locomotive.
Responsible officer	A senior driver who provides relief and support duties for footplate staff in and around the locomotive shed.
Tail lamp	A lamp carried on the rear of every train.
Tender	The vehicle attached to a locomotive that carries water and coal or other fuel.

Track circuit	An electrical device using the rails in an electric circuit to detect the absence or presence of rail vehicles on a defined section of line.
Trap points	Facing points at an exit from a siding or converging line to derail a rail vehicle making an unauthorised movement.
Underframe	The structural base or subframe which forms the support for the carriage body.
Up	Line in the direction of Leicester North station (in this case).

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